Biomass Burning Losses of Carbon Estimated from Ecosystem Modeling and Satellite Data Analysis for the Brazilian Amazon Region

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To produce a new daily emissions record of carbon from biomass burning events in the states of the Brazilian Legal Amazon, the staff has used vegetation greenness estimates from satellite images as inputs to a terrestrial ecosystem production model. This carbon allocation model generates new estimates of regional vegetation biomass at eight kilometer resolution. The modeled biomass product is then combined for the first time with fire pixel counts from the Advanced Very High Resolution Radiometer (AVHRR) to overlay regional burning activities in the Amazon.

Results from this analysis indicate that carbon emission estimates from annual region-wide sources of deforestation and biomass burning in the early 1990s are apparently three to five times higher than reported in previous studies for the Brazilian Legal Amazon, i.e., studies which implied that the Legal Amazon region tends toward a net-zero annual source of terrestrial carbon. In contrast, this analysis implies that the total net source fluxes from the Legal Amazon region range from 0.2 to 1.2 petagrams (Pg) of carbon annually, depending strongly on annual rainfall patterns. The reasons for the higher burning emission estimates are (1) use of combustion fractions typically measured during Amazon forest burning events for computing carbon losses, (2) more detailed geographic distribution of vegetation biomass and daily fire activity for the region, and (3) inclusion of fire effects in extensive areas of the Legal Amazon covered by open woodland, secondary forests, savanna, and pasture vegetation. The total area of rainforest estimated annually to be deforested did not differ substantially among the previous analyses and this one.

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New Technology Developed and Tested for Disaster Management and Mitigation

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Disasters are costly both in human life and loss of homes. Yearly, these disasters result in 133,000 deaths and 140 million homeless worldwide. Current technology for monitoring fires has relied on instrument designs that are 15 to 20 years old; these systems are large, heavy, and usually have not been designed for fire characterization and mapping.

Through a government and industry partnership, new technology has been built and tested specifically for fire monitoring. "FireMapper," a multispectral microbolometer has been built by Space Instruments, Inc. through a Small Business Innovative Research (SBIR) program sponsored by the United States Forest Service (USFS) Pacific Southwest Riverside Fire Lab.